Wisconsin Department of Transportation

Division of Business Management
Bureau of Human Resource Services
4802 Sheboygan Ave.
P O Box 7915
Madison, WI 53707-7915

Telephone: 608-266-2615
Teletypewriter (TTY): 608-267-0259
FAX: 608-264-9972

September 20, 2006

Dear Applicant:

Thank you for your interest in the Civil Engineer-Transportation Advanced position within the Division of Transportation System Development. This exam is for a position that is responsible to serve as the Structural Development Systems Engineer. The current vacancy is in the Central Office-Hill Farms Madison office and the register created by this vacancy will be used to fill other related vacancies as they occur statewide.

The first step in the selection process will be an evaluation of your experience by a panel of experts who are knowledgeable of the requirements for the position. For this evaluation, you will need to complete the attached exam. The exam has been designed to obtain specific, factual information about certain aspects of your experience that are particularly important to this position.

The evaluation of your qualifications for this position will be based solely on your response to the exam. The evaluation panel will NOT have access to your state application form or any other materials you may submit with your application.

After the evaluation of all exams, and as vacancies occur, those candidates who appear most qualified for the position will be invited to participate in the next step of the selection process. Your ranking will vary based on the number of applicants selecting the same employment areas as you select.

Refer to the attached Instruction sheet for further information on applying for this position. PLEASE NOTE: If you send the files electronically, make sure you scan the state application, veteran form, instruction sheet and affidavit sheet that requires your signature and place them in **pdf format.** Your response to the exam questions can be sent in a Word document or scanned like the other documents. **Or**, you may print out and mail all the application materials to: Mary Schneider; DOT Bureau of Human Resource Services, Room 410; P.O. Box 7915; Madison, WI 53707-7915, to be received **by 4:30 p.m., October 9, 2006**. Late materials will not be accepted if it would cause a delay in the scoring process. If you have any questions, please call me at (608) 266-7536.

Sincerely,

Jeff Fischer
Human Resources Specialist
Enc.

WISCONSIN DEPARTMENT OF TRANSPORTATION

CIVIL ENGINEER - TRANSPORTATION ADVANCED
STRUCTURAL DEVELOPMENT SYSTEMS ENGINEER
Job Announcement Code 0603151
INSTRUCTION SHEET

The following exam has been designed to obtain specific, factual information about those aspects of your experience that are particularly important to this position. These experiences may include part-time or full-time employment, internships, volunteer activities, or relevant academic course work.

INSTRUCTIONS TO THE APPLICANT:

1. Please complete the attached exam questions by keeping in mind the most relevant example of past achievements in your response.

2. **DO NOT PROVIDE AN EXISTING RESUME OR TRANSCRIPT IN LIEU OF THIS EXAM.**

3. Your name should appear only on the state application form, affidavit sheet, and the bottom of this page.

4. **Return** this Instruction sheet, the Employment Requirement Affidavit, the Application for State Employment (OSER-DMRS-38) that can be attained at **http://oser.state.wi.us/category.asp?linkcatid=392&linkid=28**, the Veteran Preference Supplement form (if applicable), and your responses to the examination **by 4:30 p.m. October 9, 2006.** You may choose to send the materials via the mail or electronically.

5. PLEASE NOTE: if you send the files electronically, send them to mary.schneider@dot.state.wi.us and make sure you scan the state application, veterans form, affidavit sheet and the instruction sheet that requires your signature and place them in **pdf format**. Your responses to the exam questions can be completed in a Word document or scanned like the other documents. **Or**, you may print out and mail all the application materials to: Mary Schneider; DOT Bureau of Human Resource Services, Room 410; P.O. Box 7915; Madison, WI 53707-7915. Late materials will not be accepted if it would cause a delay in the scoring process.

PLEASE READ AND SIGN THE FOLLOWING STATEMENT AND RETURN WITH APPLICATION MATERIALS.

I understand that this questionnaire is a test and that the practice or attempt to practice any deception or fraud will result in my application being withdrawn or removal from the position if I am hired. I certify that all information provided herein is true to the best of my knowledge, that I prepared the responses to this checklist without assistance other than typing or reproduction, and that the information can be verified if necessary through persons I have named as references on my application or by other persons whom I can name as references if requested.

SIGNATURE: _____ DATE: _____

NAME (Print): _____ SOCIAL SECURITY #: _____

ADDRESS: _____ HOME PHONE: ( ) _____

CITY, STATE, ZIP: _____ WORK PHONE: ( ) _____

_____

CIVIL ENGINEER - TRANSPORTATION ADVANCED
STRUCTURAL DEVELOPMENT SYSTEMS ENGINEER
GEOGRAPHIC LOCATION PREFERENCE SHEET

Listed below are the locations in which employment may be available. Please indicate the location(s) for which you would like to receive employment consideration by placing a checkmark in the space provided; check all those that you would consider.

Employment Areas (Check ALL that you will accept)

- ☐ Southwest Region, Madison East
- ☐ Southeast Region, Waukesha
- ☐ North Central Region, Wisconsin Rapids
- ☐ Northwest Region, Eau Claire
- ☐ Central Office-Hill Farms, Madison West
- ☐ Southwest Region, La Crosse
- ☐ Northeast Region, Green Bay
- ☐ North Central Region, Rhinelander
- ☐ Northwest Region, Superior
- ☐ Northwest Region, Spooner

EMPLOYMENT REQUIREMENT AFFIDAVIT

Check <u>ALL</u> the appropriate boxes below for the qualifications that you possess:

☐ Current registration as a Professional Engineer (P.E.) in the state of Wisconsin.

☐ Certification as an Engineer-in-Training (E.I.T.) in the state of Wisconsin.

☐ Have graduated from a recognized college or university with a degree in a related engineering field such as civil or environmental engineering or have equivalent professional training and practical experience so as to be deemed a professional engineer as defined in Department of Regulation and Licensing per s. 443.01, Wis. Stats **and** also be deemed qualified to engage in professional engineering practice as determined by the Department of Regulation and Licensing per s.443.04 or 443.05, Wis. Stats.

AFFIDAVIT: PLEASE READ AND SIGN THE FOLLOWING STATEMENT

I certify that the information provided above in application for the Civil Engineer Transportation – Advanced is true to the best of my knowledge, and that the information can be verified if necessary.

SIGNATURE: _____ DATE: _____

EXAM QUESTIONS

Question number 1.
Describe your experience and advanced education with designing, constructing and maintaining structures related to transportation highways and resolving related program issues. Be sure to describe the number and type of structures along with any outstanding engineering complexities involved.

Question number 2.
This position will administer the bridge management system. Describe your experience in managing all of the elements (in broad terms-people, data, things) associated with any type of system. Be sure to focus on the following elements of the system: the functional program area (e.g. soils, structures, pavements, widgets, etc.), information technology, communications, and key measurement criteria.

Question number 3.
Describe your experience and formal training in developing relational databases using Access, Oracle or other comparable programs, and software application programs such as Fortran, VB, VB.net, C, C++, and Java. Be sure to include a discussion of your responsibility for the associated application development life cycle for those application programs you discuss.

DON'T FORGET TO SEND IN A COMPLETED COPY OF THE STATE APPLICATION FORM WITH ALL YOUR OTHER EXAM MATERIALS

Visit http://oser.state.wi.us/category.asp?linkcatid=392&linkid=28 to obtain a copy of the State Application form and Veteran Preference Supplement form (if applicable).

DEADLINE: 4:30 p.m., October 9, 2006

See the following pages to view the complete position description.

POSITION DESCRIPTION

IMPORTANT: PLEASE READ ATTACHED INSTRUCTIONS

DER-PERS-10 (Rev. 5-84)

State of Wisconsin Department of Employment Relations PD.DOT	1. Position No.	2. Cert/Reclass Request No.	3. Agency No. 395

4. NAME OF EMPLOYEE

5. DEPARTMENT, UNIT, WORK ADDRESS

Wisconsin Department of Transportation
Division of Transportation System Development
Bureau of Structures
4802 Sheboygan Ave.
Madison, WI 53702

6. CLASSIFICATION TITLE OF POSITION

Civil Engineer Transportation - Advanced

7. CLASS TITLE OPTION *(To be filled out by Personnel Office)*

8. NAME AND CLASS OF FORMER INCUMBENT

9. AGENCY WORKING TITLE OF POSITION

Structural Development Systems Engineer

10. NAME AND CLASS OF EMPLOYES PERFORMING SIMILAR DUTIES

11. NAME AND CLASS OF FIRST-LINE SUPERVISOR

Vacant
DOT Engineering Chief

12. FROM APPROXIMATELY WHAT DATE HAS THE EMPLOYE PERFORMED THE WORK DESCRIBED BELOW?

13. DOES THIS POSITION SUPERVISE SUBORDINATE EMPLOYES IN PERMANENT POSITIONS? YES [ ] NO [X]
IF YES, COMPLETE AND ATTACH A SUPERVISORY POSITION ANALYSIS FORM (DER-PERS-84)

14. POSITION SUMMARY - PLEASE DESCRIBE BELOW THE MAJOR GOAL OF THIS POSITION:

SEE ATTACHED

15. DESCRIBE THE GOALS AND WORKER ACTIVITIES OF THIS POSITION *(Please use sample format and instructions on attached sheet.)*

- **GOALS:** Describe the major achievements, outputs, or results. List them in descending order of importance.
- **WORKER ACTIVITIES:** Under each goal, list the worker activities performed to meet that goal.
- **TIME %:** Include for goals and major worker activities.

TIME %	**GOALS AND WORKER ACTIVITIES** (Continue on attached sheets)
	SEE ATTACHED

6. SUPERVISORY SECTION - TO BE COMPLETED BY THE FIRST LINE SUPERVISOR OF THIS POSITION *(See Attached Instructions)*

a. The supervision, direction, and review given to the work of this position is [ ] close [ ] limited [X] general

b. The statements and time estimates above and on attachments accurately describe the work assigned to the position. *(Please initial and date attachments.)*

Signature of first-line supervisor _____ Date _____

17. EMPLOYEE SECTION - TO BE COMPLETED BY THE INCUMBENT OF THIS POSITION

I have read and understand that the statements and time estimates above and on attachments are a description of the functions assigned my position. *(Please initial and date attachments.)*

Signature of employe _____ Date _____

18. Signature of Personnel Manager _____ Date _____

	P-file		DER		Employee		Dept File		Cert Request

PD.DOT

14. POSITION SUMMARY (*CONTINUED*):

This position leads projects involving civil and structural engineering design systems and provides structural engineering services that develop statewide polices and procedures.

This position leads projects involving statewide bridge management and requires a comprehensive understanding of bridge management systems, information systems, and data modeling.

This position maintains, administers, and enhances the above design systems, bridge management system, and information systems. The diversity and complexity of the work and interrelationships require comprehensive structure expertise, along with computer programming, interpersonal communication, presentation and training skills, and in-depth knowledge of current database technologies, computer programming languages, system infrastructures, and web technologies. These existing systems require knowledge of programming languages: Fortran, VB, VB.net, C, C++, Java; knowledge of databases: Microsoft access, Oracle, DB2; knowledge of web technologies: JSP, XML, HTML, PDF.

This position is responsible for engineering evaluation and replacement criteria for structures, analysis of structure deterioration curves and establishment of the annual structure cost needs through the Bridge Management System and associated files.

The responsibility of this job involves professional and/or technical engineering judgments and a significant amount of discretion in completing projects and performing activities listed under Goals and Activities. These engineering projects and activities are among the most technically complex and work performed is completed without independent checking by other engineers, thereby giving this engineer a high level of responsibility and significant consequence of error.

WisDOT personnel, Engineering Consulting firms, and County personnel depend on the results of these projects and activities to enable them to design, analyze, draft, and construct economical transportation structures throughout the State.

This engineer acts as chief technical consultant to the DOT Engineering Chief and engineers below that level in the Bureau of Structures, State personnel outside the Bureau of Structures, Engineering Consultants, County personnel and engineers in outside agencies.

The engineer in this position communicates with other State DOT offices, the Federal Highway Administration, Canadian DOT offices, County personnel, Engineering Consulting firms, other outside agencies in addition to Wisconsin DOT personnel with regard to civil and structural engineering design systems, bridge manuals and standards, Bridge Management Systems, design projects, policies, and procedures.

Abide by all rules, regulations and work practices regarding safety and maintain the high safety and health standards developed and approved by the Department. Report incidents/accidents/near misses that resulted or could result in personal injury. Maintain safe working conditions and wear appropriate personal protective equipment in designated areas. Offer safety and health suggestions that would reduce risk to workers.

15. DESCRIBE THE GOALS AND WORKER ACTIVITIES OF THIS POSITION (*CONTINUED)*

TIME %	GOALS AND WORKER ACTIVITIES	
40%	A.	Coordination, design, and development of civil and structural engineering design systems.

A1. Develop new or evaluate and update existing civil and structural engineering design systems by incorporating current and future structural design requirements. These systems are developed to: (1) make engineering decisions that meet AASHTO Bridge Design Specifications, Wisconsin Bridge Design Manual and Design Standard requirements, and AASHTO Material Specifications (2) perform all required engineering calculations and (3) complete structural design requirements and create a final set of construction plans. Structural engineers use these design systems to design/draw transportation structures throughout the state.

A2. Provide management with budget information concerning project/employee time and costs for developing new or maintaining, enhancing and administering civil and structural design systems.

A3. Evaluate and make recommendations on implementation of civil and structural engineering design systems and documentation obtained from outside agencies.

A4. Correct deficiencies or errors and make improvements using engineering judgment in existing civil and structural engineering design systems that are used to design/draw transportation structures throughout the State.

A5. Make and incorporate, with authority, judgments concerning approximations of an application of engineering design concepts, design methods, engineering theory, details or other criteria into civil and structural engineering design systems which are used to design/draw transportation structures throughout the State.

A6. Prepare, distribute or exchange civil and structural engineering design systems and documentation with outside governmental agencies and universities.

A7. Inform and advise supervisor on project development matters.

30% B. Develop, implement, and maintain the Bridge Management System including the highway structures information system.

B1. Develop a working methodology to coordinate engineering criteria into an effective Bridge Management System.

B2. Create and customize data entry forms for bridge inspections, engineering maintenance, repair and rehabilitation costs.

B3. Coordinate engineering requirements of structures detailed in the Bridge Management System to other required management systems.

B4. Use Wisconsin Engineering Design Standards to improve modeling of the Bridge Management System.

B5. Develop and maintain Oracle database tables in Bridge Management System.

B6. Administer and maintain the Highway Structures Information System including; the web server utilities, the presentation layer in JSP, XML, and other web technologies, the user security, and the batch processor.

B7. Develop new bridge management functionality in the Highway Structures Information System using state of the art web technologies and bridge management and policy procedures.

15% lopment of Projects Related to Bridge Manuals, Bridge Program Policy, and Standards.

C1. Evaluate and update existing structural standard details according to current technology, Wisconsin Bridge Management Policy, AASHTO Bridge Design Specifications, AASHTO Material Specifications and engineering design theories to develop new policy and procedures to be used on transportation structures throughout the State.

C2. Conceive and recommend, based on data from DOT Regional personnel or outside agencies, new or revised policies, procedures, criteria, details, and standards relating to design or analysis of transportation structures, throughout the State, and incorporate recommendations into bridge design manuals and standards.

C3. Prepare economic studies and provide cost comparisons based on different engineering design methods, materials, structure types, and design criteria requirements; then recommend alternate policies, procedures, or standard details and incorporate recommendations into bridge design manuals, bridge program policy and standards, which are used to design transportation structures throughout the State.

C4. Make and incorporate, with authority, judgments concerning approximations of an application of engineering design concepts, design methods, theory, details, or criteria into bridge manuals, bridge program policy and standards, which are used to design transportation structures throughout the State.

C5. Inform and advise supervisor on project development matters.

15% D. Communication of Information, Performance of Structural Engineering Services, and Training Personnel in the Application of Current Practices, Standards, Procedures, and Programs.

D1. Advise and train Bureau of Structures personnel, acting as a technical consultant, in the current application of engineering design practices, details, procedures and standards for various types of transportation structures.

D2. Provide instruction to Bridge personnel, acting as a technical consultant, in the use of civil and structural engineering design systems, design system user manuals, bridge design manuals and standards, and bridge related products.

D3. As a technical consultant, answer inquiries from State personnel outside the Bureau of Structures, engineering consultants, county personnel. Federal Highway Administration personnel, and other outside agencies, regarding bridge related products, materials, standard details, bridge manuals, engineering design policies and procedures, current AASHTO Specifications, and civil and structural engineering design system applications.

D4. As a technical consultant, interpret for, coordinate with, and give guidance to engineering consultants and DOT Regional personnel in application of policies, procedures, details and standards related to various types of transportation structures.

D5. Perform an engineering design or analysis of various transportation structures that are unique or complex and require special structural engineering design systems or special modification of existing structural design programs.

D6. Provide information and/or data to Universities, other State agencies, and other engineering organizations doing research on various types of transportation structures.

KNOWLEDGE AND SKILLS

1. Knowledge of advanced structural design/analysis theories, indeterminate structural analysis methods, elastic and plastic design methods, load resistance-factor design, curved beam design and matrix analysis methods and their application for finding solutions of simultaneous equations. (A1, A3-A6, B1, B2, B4, C1-C4, and D1-D6)

2. Knowledge of advanced structural steel design and welding principles. (A1, A3-A6, B1, B2, B4, C1-C4, and D1-D6)

3. Knowledge of advanced reinforced concrete design. (A1, A3-A6, B1, B2, B4, C1-C4, and D1-D6)

4. Knowledge of prestressed concrete theory and design. (A1, A3-A6, B1, B2, B4, C1-C4, and D1-D6)

5. Knowledge of advances engineering mechanics of materials. (A1, A3-A6, B1, B2, B4, C1-C4, and D1-D6)

6. Knowledge of strength of materials and materials testing. (A1, A3-A6, B1, B2, B4, C1-C4, and D1-D6)

7. Knowledge of soil mechanics, shallow and deep foundations and design of retaining structures. (A1, A3-A6, B1, B2, B4, C1-C4, and D1-D6)

8. Knowledge of substructure analysis and design. (A1, A3-A6, B1, B2, B4, C1-C4, and D1-D6)

9. Knowledge of physics, statics and dynamics. (A1, A3-A6, B1, B2, B4, C1-C4, and D1-D6)

10. Knowledge of finite element theory and analysis. (A1, A3-A6, B1, B2, B4, C1-C4, and D1-D6)

11. Knowledge of American Institute of Steel Construction Manual. (A1, A3-A6, B1, B2, B4, C1-C4, and D1-D6)

12. Knowledge of American Concrete Institute Design Code. (A1, A3-A6, B1, B2, B4, C1-C4, and D1-D6)

13. Knowledge of American Association of State Highway and Transportation Officials (AASHTO) Specifications for Highway Bridges. (A1, A3-A6, B1, B2, B4, C1-C4, and D1-D6)

14. Knowledge of AASHTO Manual for Maintenance Inspection of Bridges. (A1, A3-A6, B1-B5, C1-C4, and D1-D6)

15. Knowledge of highway geometric design. (A1, A3-A6, B1, B2, B4, and C1-C4)

16. Knowledge of surveying practices. (A1, A3-A6, B1, B2, B4, and C1-C4)

17. Knowledge of fatigue of engineering materials, theory and applications. (A1, A3-A6, B1, B2, B4, C1-C4, and D1-D6)

18. Knowledge of engineering economy and value engineering principles. (A1, A3-A5, C5 and D6)

19. Knowledge of higher mathematics (calculus, geometry, trigonometry, linear mathematics). (A1, A3-A6, B1-B5, C1-C4, and D1-D6)

20. Knowledge of technical writing and specification writing. (C1, C2, C5, D2, and D6)

21. Knowledge of computer hardware basics. (A1-A6, B2, and B5-B7)

22. Knowledge to create and modify commands in civil and structural engineering design systems using current Fortran programming language. (B2, and B5-B7)

23. Knowledge to develop and maintain design systems in programming languages including: Fortran, VB, VB.net, C, C++, and Java. (A1-A6, B2, and B5-B7)

24. Knowledge to maintain and develop databases in Microsoft access, Oracle, DB2. (A1-A6, B2, and B5-B7)

25. Knowledge to develop and maintain web technologies in JSP, XML, HTML, PDF. (A1-A6, B2, and B5-B7)

26. Knowledge to create civil and structural engineering design system architecture using subroutines, input and output files and permanent storage data base files. (A1-A6, B2, and B5-B7)

27. Knowledge of SQL file inquiry and report language, to create reports from HSI Structures information system for use by DOT personnel and outside agencies. (B2, B6, and B7)

28. Knowledge and ability to apply structural engineering theories to design and analysis of complex structural problems. (A1, A3-A6, B1, B2, B4, C1-C4, and D1-D6)

29. Knowledge of Bridge Design Manual, Bridge Computer Manual and Bridge Standards (38 chapters in Design Manual, more than 40 programs in the computer Manual, and more than 100 standards). (A1, A3-A6, B1, B2, B4, C1-C4, and D1-D6)

30. Knowledge of State Bridge Inventory File. (B1, B3, B4)

31. Knowledge of Wisconsin Department of Transportation Facilities Development Manual (FDM). (A1, A3-A6, B1, B2, B4, C1-C4, and D1-D6)

32. Knowledge of investigating existing structural problems, analyze data, develop hypotheses and determine solution. (A1, A3-A6, B1, B2, B4, C1-C4, and D1-D6)

33. Knowledge gained in experience in bridge design and construction. (A1, A3-A6, B1, B2, B4, C1-C4, and D1-D6)

34. Knowledge to test and evaluate new design programs sent in by outside agencies. (A2, A7)

35. Knowledge in resolution of conflicts of technical issues and interpersonal relationships. (A7, C6, D2-D3, and D6)

36. Knowledge of written and oral communication skills. (A1-A7, B1-B7, C1-C5, and D1-D6)

37. Ability to organize information and make presentations to State personnel and outside agencies. (D2-D3, and D6)

38. Knowledge of Bridge Management Systems. (B1-B5)

39. Knowledge of modeling techniques used by Bridge Management Systems. (B1-B5)